

THURSDAY, JULY 31, 1884

FORESTRY

Introduction to the Study of Modern Forest Economy, and Forestry in Norway, with Notices of the Physical Geography of the Country. By John Croumbie Brown, LL.D. (Edinburgh: Oliver and Boyd, 1884.)

EVERYTHING connected with forestry is especially attractive just now when so much attention is being drawn to the subject in its very varied aspects by the Exhibition at Edinburgh. Dr. J. C. Brown is one of the most voluminous writers we have on forest matters; his pen indeed is scarcely ever at rest, for he has told us about forests and forest management in various parts of the world, both in ancient and modern times, and now he publishes just at an opportune moment two little books the titles of which are given above. The first of these he tells us is issued in accordance with, and in discharge of, obligations imposed by a resolution passed on March 28 last year by a "scientific, practical, and professional" assemblage presided over by the Marquess of Lothian for the purpose of furthering "the establishment of a national School of Forestry in Scotland," and the promotion of "an International Forestry Exhibition in Edinburgh in 1884," the last of which is now being realised, but the former has yet to be accomplished, we hope, however, at no distant date.

Dr. Brown's first book commences by defining what a forest is, and he then goes on to point out that "in the conservation, culture, and exploitation, or profitable disposal, of forest products considerable differences of practice exists," as, for instance, the preservation of game in this country, while on the Continent the wood is the primary object. "In Britain," he says, "we hear much of arboriculture; on the Continent we hear much of sylviculture; the former refers to woods and plantations, the other term speaks of woods and forests; in the one case the unit is the tree, and the wood is considered as the collection of trees; in the other the wood is the unit, and the trees are considered only as the constituent parts. In the former attention is given primarily to the sowing and planting, and pruning it may be, and general culture of the tree; nowhere perhaps has this arboriculture been carried nearer to perfection than it has been in Britain, and the effects produced by the resulting woods are wonderful. In the latter, attention is given primarily to the wood or forest as a whole, capable of yielding products which can be profitably utilised; and the result generally is to produce a much greater proportion of fine trees than does even the arboriculture which has been referred to. And not less different is the exploitation of woods in Britain and on the Continent. In Britain the pecuniary return obtained from woods is considered a secondary matter in comparison with the amenity and shelter which they afford; but on the Continent the materials or pecuniary product, or other economic good, is made the object of primary importance."

This opens the subject of forestry in its widest aspect, and Dr. Brown naturally draws from it a moral on the necessity of forming the much talked of British School of Forestry. The book is divided into three parts, in the first of which the successive chapters treat of the following sub-

jects: Ancient Forests of Europe, the disappearance of European Forests, the evils which have followed their destruction, scarcity of timber and firewood, droughts, floods, landslips, and sand drifts. The second part is devoted to the consideration of "Elements of Modern Forest Economy," under which head we find chapters on Forest Conservation, Replanting or Reboisement, as Dr. Brown prefers to call it after the French usage; Exploitation or Management, Sartage and Jardinage, or Clearance and Selection, &c., concluding this part with a chapter on the study of Pathology. The third part is simply a short notice of modern forest conservancy in general. All these points are of extreme importance in a well-organised system of forest teaching, and under each head Dr. Brown brings together a quantity of matter which, besides being of a practical character, and consequently valuable, is also interesting reading. He possesses the power in an eminent degree of weaving into one uniform fabric what has been said by various writers on the subject that he has so much at heart, for Dr. Brown's books contain long and numerous quotations, through which it will not be necessary to follow him. On the study of pathology, however, as one of the branches in the curriculum of a forest officer's education, we entirely agree with him as to its great importance. It should indeed be equally imperative that a young forester should know something of the nature of the diseases with which the trees under his care are liable to be attacked, as that he should be acquainted with the structure, constitution, and habits of those trees, so that he may be enabled, if occasion requires, to cope with their diseases, and if possible save the victims from premature decay. For this reason a pathological museum should be attached to every forest school, and specimens might be continually added to it by preserving those that might be brought into the school for determination. Such a museum indeed is referred to by Dr. Brown in the following paragraph:—"In the Museum of the Prussian Forest Institute at Eberwalde the impression produced upon the mind of the visitor is that there are there specimens representative of every disease to which trees are heir; specimens exhibiting the progress of the disease from the attack to the consummation; and, hard by, the bark, the wood, the insect, or the parasitic herb or fungus by which it has been induced, the insect and the fungus being exhibited under all the transformations through which they pass; while specimens of the effects of lightning and other physical causes of the decay or destruction of trees are not lacking. And similar collections sufficient to afford facilities for the study of the diseases of trees and of means of preventing or of remedying the evils done are to be found in many other similar institutions." Dr. Brown concludes his first book with a sketch of the curriculum of the Spanish School of Forestry, which includes a wide range of subjects in mechanics, physics, acoustics, heat, optics, electricity, meteorology, chemistry, natural history, including botany and zoology. "The instruction is given (1) by oral lectures and lessons in drawing by the professors; (2) by written exercises, calculations, and analyses on the subjects embraced by these lectures; (3) by the detailed study of the animals, rocks, plants, and forest products which constitute the collections and adjuncts of the establishment; (4) by the practice of topography, land-surveying, the

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study of natural history, and of mountains in the field; (5) by excursions to the plantations and mountains."

With regard to the status of forest officers in different parts of Europe they are described as taking rank with military men and other Government officers of recognised social position, and having in many instances an official uniform and a higher salary than is accorded to military officers, by way of compensation for the monotonous life they are called upon to lead in the forests, which often has a depressing influence—"day after day, month after month—trees, trees, trees everywhere, trees and shade, trees and shade—shade that reminds one of the expression 'the valley of the shadow of death.'"

"Forestry in Norway" is a book of a different character from the preceding. It treats of the general features of the country in its various aspects, with especial regard of course to its arboreal vegetation, and the effects of temperature, rainfall, rivers, lakes, mountains, valleys, &c. The book is for the most part very pleasant reading.

In Chapter IV., under the head of Geographical Distribution of Trees in Norway, Dr. Brown shows that he has made himself acquainted with the modern literature of the subject, especially with the well-known report and maps prepared by Dr. F. C. Schubeler, Professor of Botany in the University of Christiania. From this and from the numerous other works cited the conclusion is drawn that the true forests of Norway are composed almost entirely of the Norway spruce fir (*Picea excelsa*, Link.) and the Scotch fir (*Pinus sylvestris*, L.), though some other trees, as the elder, beech, and oak, are found forming little woods. We must here point out that nearly the whole of this chapter requires careful editing. There is no excuse for the retention of old and exploded names, still less perhaps for absolute mistakes. On p. 39, for instance, it is stated that the Norway spruce is generally known as *Abies communis*, a name under which very few indeed would know it except those well versed in the synonymy of the plant. On the same page *Millaw* is printed for Miller, *Lank* for Link; and a page or two further on, the Norwegian birch is referred to *Betula odorata*, Bechet, when it should be *B. alba*, L. Again on p. 45 we are told that two species of oak "are found growing wild in Norway, the sessile-fruited oak, *Quercus robur*, W., and the common oak, *Q. pedunculata*, W." The fact is that the sessile-fruited oak is *Q. sessiliflora*, Sm., and the pedunculated oak, *Q. pedunculata*, Ehr., both of which are now placed by most modern authorities under the one name of *Quercus robur*, L. Similar instances occur further on, as well as misspellings, all of which could be easily rectified, and the book made more trustworthy.

The general readable nature of the bulk of the book will no doubt cause it to be read by those into whose hands it may fall, whether they are specially interested in forestry or not, and will thus form one means of promoting the extended use of the volume.

LENSES

Lenses and Systems of Lenses. By Chas. Pendlebury, M.A., F.R.A.S., Senior Mathematical Master of St. Paul's. (Cambridge: Deighton, Bell, and Co., 1884.)

WE are glad to welcome at last an English book on this subject, on which up to the present but little has been written in our language. An abstract of

Gauss's paper in Taylor's *Scientific Memoirs*, and a paper by Maxwell in the second volume of the *Quarterly Journal of Mathematics* form, so far as we are aware, the main English literature of the subject. Of course since the time of Gauss foreign writers have used it freely: Listing, Helmholtz, and Carl Neumann in Germany, Verdet and others in France, have introduced it with more or less modification into their works. We would suggest that a list of books and memoirs on the subject would form a valuable addition to Mr. Pendlebury's book. The author gives frequent references in footnotes to books or papers from which he has drawn information, but a complete list would be a great help to others studying the subject. The method itself is very elegant and attractive, though somewhat barren of results; perhaps this is the reason why it has been neglected in England. It enables us to obtain a beautiful solution of the problem to a first approximation when all the rays make but small angles with the axis, but refuses to help us further.

The book before us is clear and well written, though perhaps unnecessarily long. Mr. Pendlebury has three chapters successively on refraction at a single surface, at two surfaces, and at any number of surfaces. This would be very well for a student who was supposed to begin the study of optics with this book, but such a student is hardly likely to exist; and one who has read the ordinary text books on the subject could easily follow at once the reasoning of the most complicated case, and might be left to deduce the others so far as they differ from it as corollaries.

Referring, however, to some points in the book, we think that in Fig. 4 it would have been better to take as the standard case one in which the points X and X' both lie to the same side of A, the case usually considered in text-books on optics. This would have obviated the necessity of having to put a negative sign to the symbol *u* in the algebraical work. Attention also might with advantage be called to the point that one of the two focal distances is negative.

Again, a difficulty occurs when we compare the results of Sections 67 and 74; in the one we have

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f},$$

while, using the same notation, the results of the other may be written

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}.$$

The explanation, of course, is that Fig. 18, from which the last result is deduced, is not drawn for the standard case of a lens forming a virtual image of an object. There is another small point of arrangement which it seems to us might be slightly modified with advantage; we would draw a rather more definite line between the analytical and geometrical methods of treating the subject.

If we assume that a pencil of rays diverging from a point will, after refraction, pass through a point, we can prove geometrically the existence of the principal points, the focal points, and the nodal points. We cannot, however, without analysis, find the position of these points in terms of the curvatures and distances between the various refracting surfaces.

Again, if we assume the position of the focal and